• Letter to the Editor •

Anterior capsule contraction syndrome: a successful multimodal therapeutic approach

Lisa Toto, Pasquale Viggiano, Luca Vecchiarino, Federica Evangelista, Enrico Borrelli, Leonardo Mastropasqua

Ophthalmology Clinic, Department of Medicine and Science of Ageing, University G. D'Annunzio Chieti-Pescara, Chieti 66100, Italy

Correspondence to: Pasquale Viggiano. Ophthalmology Clinic, Department of Medicine and Science of Ageing, University G. D'Annunzio Chieti-Pescara, Chieti 66100, Italy. pasquale.viggiano90@gmail.com

Received: 2018-11-20 Accepted: 2019-02-23

DOI:10.18240/ijo.2019.08.20

Citation: Toto L, Viggiano P, Vecchiarino L, Evangelista F, Borrelli E, Mastropasqua L. Anterior capsule contraction syndrome: a successful multimodal therapeutic approach. *Int J Ophthalmol* 2019;12(8):1356-1358

Dear Editor,

I am Dr. Lisa Toto, from Department of Medicine and Science of Ageing, University G. D'Annunzio Chieti-Pescara, Chieti, Italy. I write to present a case report of anterior capsule contraction syndrome (ACCS).

ACCS is a condition that can occur after cataract surgery and intraocular lens (IOL) implantation[1]. This disorder is secondary to an excessive contraction and fibrosis of the spared anterior capsule, which may result in the obstruction of the visual axis, or alternatively may cause late complications to the IOL, including pseudophacodonesis and IOL tilt, decentration, or dislocation[1]. Several approaches have been used to treat this condition such as the use of Nd:YAG laser or through surgical treatment. In this case report we propose a multimodal therapeutic approach to successfully solve this post-surgical complication.

A 51-year-old woman was referred to our department presenting with blurred vision in her left eye (LE) for one week. The patient underwent cataract surgery with phacoemulsification and IOL implantation in the capsular bag two months before. A Zeiss CT ASPHINA 404 [aspheric Hydrophilic acrylic (25%) IOL with hydrophobic surface, Carl Zeiss Meditec Inc., Germany] IOL (-06 diopters) for emmetropia was successfully implanted in the capsule with 360° overlapping of capsular edge onto the anterior IOL optic surface. All surgical procedures were uneventful. The same IOL was implanted about two months earlier in the RE. Furthermore, the two eyes were known to be affected by high myopia (axial length of 31.15 mm in the RE and axial length of 31.28 mm in the LE) and pseudoexfoliation syndrome (PEX) only in the LE. Her medical history was otherwise unremarkable.

At presentation, best-corrected visual acuity (BCVA) was 0.0 and 1.0 logMAR in her RE and LE, respectively. Slit lamp anterior segment examination of the LE revealed anterior capsule fibrosis occluding the visual axis (Figure 1A-1C). The patient also underwent anterior segment optical coherence tomography (AS-OCT), which revealed the presence of a hyperreflective and thick band adherent to the anterior surface of the IOL (Figure 1A-1C). Because of the insufficient clear media to allow ophthalmoscopy, B-scan ultrasound was performed and no alterations of the retina and vitreous were discerned. A diagnosis of ACCS was thus made.

The therapeutic approach to resolve this disease was divided in three complementary and following phases. The first (or preoperative) phase was completed using a Nd:YAG laser to create three holes into the fibrotic material (Figure 1D). The energy was 3.2 μJ. During the second phase a dispersive ophthalmic viscosurgical device (OVD) (IAL-f) [distributed by TRB Chemedica (Thailand) Ltd.] was injected between the anterior capsule and the IOL optic to increase the space between them although the three holes and under this patch to protect the IOL. The third phase was performed using a femtosecond laser: the CATALYS Precision Laser System (Abbott Medical Optics, Inc., Santa Ana, CA, USA). It combines pulses of less than 600 femtosecond laser, gentle liquid optics interface, and integrated 3D Full Volume Optical Coherence Tomography (OCT) image-guidance system to create precise incisions in the lens and cornea. During this phase, the patient's eye was properly docked to the system, a 3.7 mm circular-shaped cut of the pathological fibrosis were created by the laser and under the guided of Catalys femtosecond laser (Figure 2). The energy was 13 μJ with a spot separation of 3 μm and a layer separation of 3 μm. After the treatment, the patient is rotated back under the operating microscope and the additional capsule ring is removed with a 23-gauge microforceps. Finally, the remaining OVD was removed and the corneal incisions were hydrated with a balanced salt solution. The patient was instructed to apply topical dexamethasone tobramycin 4 times a day for 1mo.

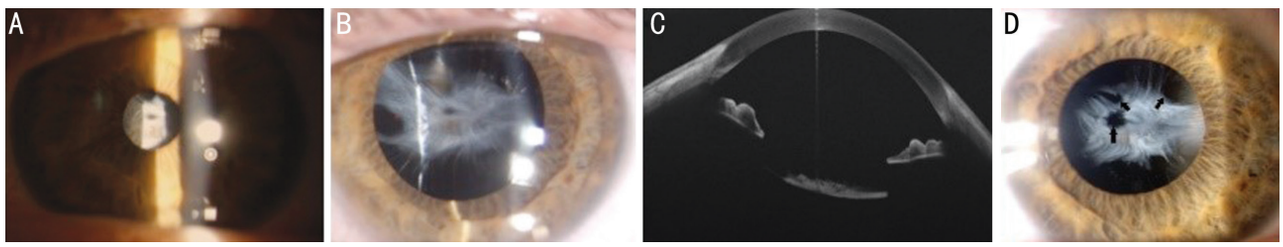

Figure 1 Capsule phimosis with complete occlusion of the optical zone due to an excessive contraction and fibrosis of the spared anterior capsule A, B: Slit lamp segment anterior photography of the left eye in miosis and midriasis; C: AS-OCT showing capsular fibrosis adherent to the anterior surface of the IOL; D: Slit lamp segment anterior photography of the left eye after using Nd:YAG laser to create three holes into the fibrotic material (black arrows).

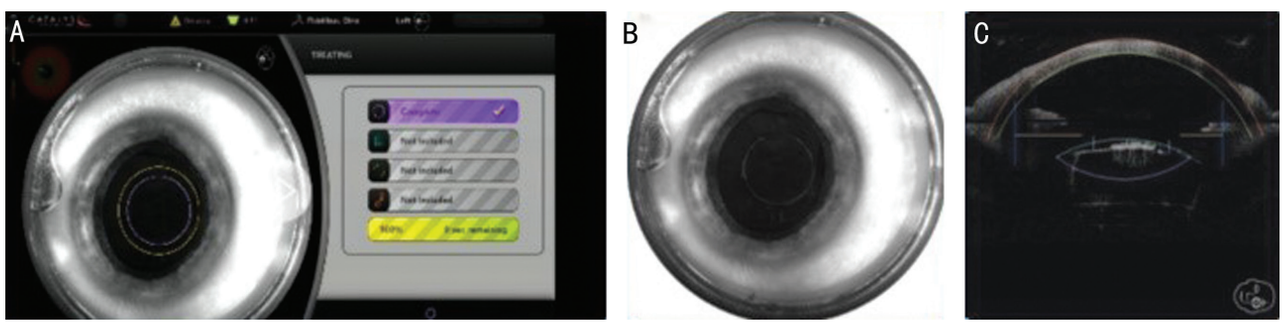

Figure 2 Phimosis excision A: The eye is docked to the laser, and the capsulotomy (violet circle) is aligned on the center of the pupil and includes the central part of the phimosis of the capsule; B: Completion of capsulotomy treatment; C: Optical coherence tomography image of anterior capsule phimosis in sagittal section; planned femtosecond laser incision.

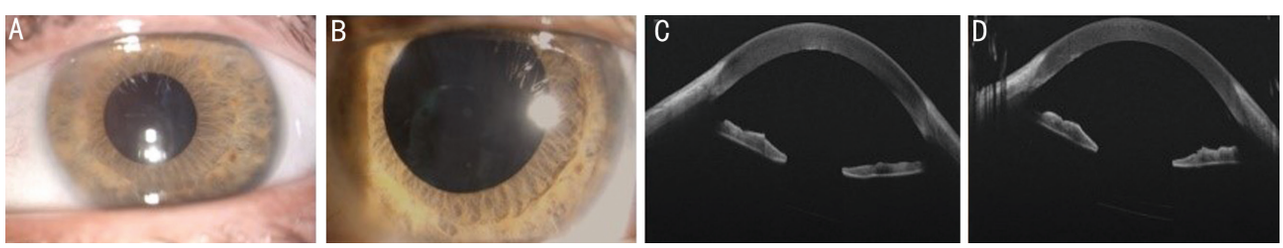

Figure 3 After multimodal therapeutic approach Slit lamp segment anterior photography of the left eye after capsulotomy femtosecond laser at 1-day follow-up visit (A) and at 1-month follow-up visit (B). AS-OCT at 1-day follow-up visit (C) and at 1-month follow-up visit (D).

At 1d postoperatively, the BCVA was 0.7 logMAR in the left eye and the patient reported a significant improvement of the visual symptoms. Both AS-OCT and indirect ophthalmoscopy demonstrated a complete removal of the fibrotic material (Figure 3). At the 1-week and 1-month follow-up visits, the BCVA was 0.4 logMAR and 0.2 logMAR, respectively, and both visual symptoms and clinical alterations were completely resolved (Figure 3).

Although ACCS is a relatively rare complication occurring after phacoemulsification, there are some cases described in the literature.

The exact etiology of ACCS is not well understood, however there are some risk factors[2]. associated with this disorder, including preexisting systemic and ocular conditions (*e.g.* advanced age, diabetes mellitus, Bechet's syndrome, myotonic muscular dystrophy, zonular weakness, chronic intraocular inflammation, PEX[3-4], retinitis pigmentosa, and high myopia)[1,4-5], a continuous curvilinear capsulorhexis (CCC) of small size[1,6-7] and the IOL material and design, with silicone, acrylic, plate haptic, and polyHEMA IOLs that have been associated with a higher rate of ACCS. Our patient was thus characterized by some risk factors for ACCS, including PEX[3,5], high myopia[5], and acrylic IOL implantation[1,8-9].

The pathogenic process leading to ACCS is poorly defined. Some authors speculated that a population of vital crystalline epithelial progenitor cells (LECs), which may be still present on the capsular bag even after cataract surgery, might differentiate into fibrous cells. The metaplasia of these cells might be thus causative of the fibrosis anterior to the IOL, which is hallmark of ACCS[2,7,10].

Although ACCS is frequently asymptomatic, symptoms of ACCS may include painless, progressive blurred vision. Advanced cases may be associated with glare, haloes, or monocular diplopia in those cases ACCS causes IOL decentration.

ACCS was first reported by Davison[1] who described a case of anterior capsular fibrosis following cataract surgery. Since this first description, several authors have tried to find the best approach to either prevent or treat this complication.

In order to prevent ACCS occurrence, Davison[1] first proposed YAG laser relaxing anterior capsulotomies at 2 to 3wk after cataract surgery. This is thought to reduce contracture of the anterior capsule and consequently reduce the incidence of ACCS. Another preventing approach was proposed by Munoz and Alio[11] who introduced the use of capsular tension rings that maintain the round shape of the capsular bag and prevent an excessive capsular shrinkage and fibrosis.

Therapeutic approaches to ACCS are numerous. These include the use of YAG laser to open the anterior fibrosis, as reported by Wilde *et al*[12] who described two cases where YAG laser was performed in a continuous circular fashion to create a free-floating fragment. However, after treatment, this fragment moved to the inferior part of the anterior chamber and obscured vision during reading. In another previous report, the authors[13] described a patient with ACCS treated with a vitrector to create and remove a circular fibrotic flap[13]. Gerten *et al*[14] performed the first femtosecond laser-assisted openings of a phimotic anterior capsules. They used the Lensx femtosecond laser (Alcon Laboratories, Inc., USA) and this approach may offer advantages especially in partial occlusion of anterior capsulorhexis.

In the current case we performed a multimodal and combined therapeutic approach to solve ACCS. We showed that this approach may be considered safe and effective. In particular, we believe this may represent a valuable approach for at least three reasons. First, the use of a conventional approach like Nd:YAG laser to create three holes into the fibrotic material allowed for the successive injection of viscoelastic material that protects the IOL during the surgical phase. Second, the employment of a femtosecond laser yielded the creation of a circular fibrotic patch, which may preclude recurrence and reduce the refractive changes (hyperopic shift, internal astigmatism) introduced by the capsule phimosis. Finally, the surgical removal of this patch led to absence of obstacle at reading. This multimodal approach is characterized by more benefits respect to the conventional approaches regarding complete occlusion of the optical zone. Using only Nd:YAG laser has disadvantages, in particular a high emission of laser energy may weaken the zonular fibers, break the posterior capsule, or destabilize the IOL position, resulting in IOL dislocation. Although the femtosecond laser approach seems to reach good results, in this case report the presence of a thick capsule fibrosis adherent to the anterior surface of the IOL optic could make difficult the planning of capsule incision and subsequent treatment without avoiding damage of the IOL during laser treatment. The subcapsular injection of OVD allowed the separation of the two planes *id est* capsule and anterior IOL optic making laser procedure safer and efficient. In conclusion, in this case report we provided a novel and multimodal strategy to resolve ACCS. This strategy is safe and effective. If replicated in future studies, this multimodal approach may prove to be a useful treatment for ACCS.

ACKNOWLEDGEMENTS

Conflicts of Interest: Toto L, None; **Viggiano P,** None; **Vecchiarino L,** None; **Evangelista F,** None; **Borrelli E,** None; **Mastropasqua L,** None.

REFERENCES

1 Davison JA. Capsule contraction syndrome. *J Cataract Refract Surg* 1993;19(5):582-589.

2 Spang KM, Rohrbach JM, Weidle EG. Complete occlusion of the anterior capsular opening after intact capsulorhexis: clinicopathologic correlation. *Am J Ophthalmol* 1999;127(3):343-345.

3 Kim ES, Kim M, Lee SJ, Han SB, Yang HK, Hyon JY. Postoperative occlusion of visual axis with fibrous membrane in the presence of anterior capsular phimosis in a patient with pseudoexfoliation syndrome: a case report. *BMC Ophthalmol* 2016;16(1):213.

4 Reyntjens B, Tassignon MJ, Van Marck E. Capsular peeling in anterior capsule contraction syndrome: surgical approach and histopathological aspects. *J Cataract Refract Surg* 2004;30(4):908-912.

5 Jin-Poi T, Shatriah I, Khairy-Shamel ST, Zunaina E. Rapid anterior capsular contraction after phacoemulsification surgery in a patient with retinitis pigmentosa. *Clin Ophthalmol* 2013;7:839-842.

6 Choi M, Lazo MZ, Kang MJ, Lee J, Joo CK. Effect of number and position of intraocular lens haptics on anterior capsule contraction: a randomized, prospective trial. *BMC Ophthalmol* 2018;18(1):78.

7 Michael K, O'Colmain U, Vallance JH, Cormack TG. Capsule contraction syndrome with haptic deformation and flexion. *J Cataract Refract Surg* 2010;36(4):686-689.

8 Balestrazzi A, Malandrini A, Martone G, Marigliani D, Caporossi T, Tosi GM. Capsule contraction syndrome with a microincision foldable hydrophilic acrylic intraocular lens: two case reports and review of the literature. *Case Rep Ophthalmol* 2014;5(3):329-335.

9 Werner L, Pandey SK, Escobar-Gomez M, Visessook N, Peng Q, Apple DJ. Anterior capsule opacification: a histopathological study comparing different IOL styles. *Ophthalmology* 2000;107(3):463-471.

10 Tadros A, Bhatt UK, Abdul Karim MN, Zaheer A, Thomas PW. Removal of lens epithelial cells and the effect on capsulorhexis size. *J Cataract Refract Surg* 2005;31(8):1569-1574.

11 Muñoz G, Alió JL. Capsular tension ring as adjuvant in phacoemulsification surgery. *Dev Ophthalmol* 2002;34:106-118.

12 Wilde C, Ross A, Awad M, Chen HC, Dua HS. Management of anterior capsular contraction syndrome: pitfall of circular capsulotomy technique with the neodymium YAG laser. *Eye (Lond)* 2018;32(9):1546-1548.

13 Yeh PC, Goins KM, Lai WW. Managing anterior capsule contraction by mechanical widening with vitrector-cut capsulotomy. *J Cataract Refract Surg* 2002;28(2):217-220.

14 Gerten G, Schultz M, Oberheide U. Treating capsule contraction syndrome with a femtosecond laser. *J Cataract Refract Surg* 2016;42(9):1255-1261.